



EXHIBIT 1

ISSUED CLAIMS

Application No. 10/153,638

U.S. Patent No. 6,739,894

Attorney Docket No. 04208.0146-0000

Filed: May 24, 2002

1. A socket for an IC package comprising:

a socket body having a receptacle portion for the IC package and contacts arranged on a bottom surface of said receptacle portion, wherein the contacts are resiliently displaceable in an up and a down direction;

a latch pivotably provided in said socket body and biased toward said receptacle portion by spring means;

latch releasing means, provided for relative movement with respect to said socket body, for moving said latch away from said receptacle portion against a spring force applied by said spring means; and

motion magnitude restricting means for restricting the movement of said latch toward said receptacle portion to a predetermined position, so that the spring force is prevented from exerting any pressure on the contacts past the predetermined position.

2. A socket for an IC package as claimed in claim 1, wherein said receptacle portion is formed in a positioning base formed separately and exchangeable from said socket body, and said motion magnitude restricting means formed at a top portion of said positioning base.

3. A socket for an IC package as claimed in claim 1, further comprising a cover member provided for relative motion in the up and down directions with respect to said socket body and having an opening at a center portion thereof.

4. A socket for an IC package as claimed in claim 2, further a cover member provided for relative motion in the up and down directions with respect to said socket body and having an opening at a center portion thereof.

5. A socket for an IC package as claimed in claim 4, wherein said latch releasing means includes a connection metal connecting said cover member and a pivot shaft of said latch and a slot formed in said socket body for guiding said pivot shaft of said latch.

6. A socket for an IC package as claimed in claim 5, wherein said latch includes a sectionally bill shaped tip end portion on opposite side of said pivot shaft and a first tilted surface on a lower side of said pivot shaft, and said positioning base formed with a second tilted surface formed substantially parallel to said first tilted surface.

7. A socket for an IC package comprising:

a socket body having a quadrangular IC package receptacle portion and a plurality of contacts arranged in a bottom surface of said receptacle portion, said contacts resiliently displaceable in an up and a down direction;

a pair of latches pivotably provided in said socket body and being biased toward said receptacle portion by spring means;

latch releasing means, provided for relative movement with respect to said socket body, for moving said pair of latches away from said receptacle portion against said spring means; and

motion magnitude restricting means for restricting the movement of each latch toward said receptacle portion to a predetermined position for each latch, so that the spring force is prevented from exerting any pressure on the contacts past each predetermined position.

8. A socket for an IC package as claimed in claim 7, wherein said receptacle portion is formed in a positioning base formed separately and exchangeable from said socket body, and said motion magnitude restricting means formed at a top portion of said positioning base.

9. A socket for an IC package as claimed in claim 7, further comprising a cover member provided for relative motion in the up and down directions with respect to said socket body and having an opening at a center portion.

10. A socket for an IC package as claimed in claim 8, further comprising a cover member provided for relative motion in the up and down directions with respect to said socket body and having an opening at a center portion.

11. A socket for an IC package as claimed in claim 10, wherein said latch releasing means includes a pair of connection metals connecting said cover member and pivot shafts of said pair of latches and a pair of slots formed in said socket body for guiding said pivot shafts of said pair of latches.

12. A socket for an IC package as claimed in claim 11, wherein each of said latches includes a sectionally bill shaped tip end portion on an opposite side of said pivot shaft and a first tilted surface on a lower side, and said positioning base having a second tilted surface formed substantially parallel to said first tilted surface.

ISSUED CLAIMS

Application No. 10/161,641  
U.S. Patent No. 6,758,684  
Attorney Docket No. 04208.0151-0000  
Filed: June 5, 2002

1. An IC socket of an open top type having a plurality of pin type contacts for electrical connection with an IC package inserted into the IC socket comprising:
  - a socket body having a base plate;
  - a movable cover;
  - a platform attached to the base plate and having an IC package mounting portion and positioning portions; and
  - edge moving mechanisms configured to exert downward force on an IC package sufficient to hold the IC package in place on the platform and configured to exert lateral force on an IC package and to thereby adjust the IC package in a horizontal direction bringing the IC package in contact with the positioning portions;  
wherein the edge moving mechanisms each have a latch lever, having an outer end pivotally supported on the IC socket and an inner end, and said edge moving mechanisms each further having a plate spring provided on an underside of the latch lever, said edge moving mechanisms collectively holding the IC package between the inner end of the latch lever and the platform; and  
wherein, before the latch lever is fully closed, the plate spring engages a molded portion of the IC package, exerting a force sufficient to adjust the IC package in the horizontal direction.
2. An IC socket as claimed in claim 1, wherein the edge moving mechanisms are arranged by selecting a corner portion of the IC package mounting portion as a reference positioning portion.
3. An IC socket as claimed in claim 1, wherein the IC package is of a ball grid array type.
4. An IC socket as claimed in claim 1, wherein the edge moving mechanisms exert the lateral force adjusting the position of the IC package in the horizontal direction to bring the IC package into contact with positioning portions before the edge moving mechanisms exert the downward force sufficient to hold the IC package in place on the platform.
5. An IC socket of an open top type having a plurality of pin type contacts for electrical connection with an IC package inserted into the IC socket comprising:

a socket body having a base plate;  
a vertically movable cover;  
a platform attached to the base plate and having an IC package mounting portion and positioning portions; and  
edge moving mechanisms, said edge moving mechanisms comprising:  
a latch lever configured to engage a top portion of an IC socket and exert a downward force when said edge moving mechanism is pivoted downward in the vertical direction; and  
a plate spring positioned on the underside of the latch lever to engage an edge portion of an IC socket and to exert a horizontal force when said edge moving mechanism is pivoted downward in the vertical direction;  
wherein, before the latch lever is fully closed, the plate spring engages a molded portion of the IC package, exerting a force sufficient to adjust the IC package in the horizontal direction.

6. An IC socket as claimed in claim 5, wherein said latch lever is pivotally supported at its outer end by a pin on the socket body and has a press portion on its inner end and a slide pin protruding from its side loosely fitted in a horizontal slot in a vertically movable drive member.

7. An IC socket as claimed in claim 5, wherein said plate spring is configured to engage an edge portion of an IC socket and exert a horizontal force before said latch lever exerts a downward force on said top portion of an IC package when the edge moving mechanism is pivoted downward in the vertical direction.

8. An IC socket as claimed in claim 5, wherein the edge moving mechanisms are arranged by selecting a corner portion of the IC package mounting portion as a reference positioning portion.

9. An IC socket of an open top type having a plurality of pin type contacts for electrical connection with an IC package inserted into the IC socket comprising:

a socket body having a base plate;  
a movable cover;  
a platform attached to the base plate and having an IC package mounting portion and positioning portions; and  
edge moving mechanisms configured to exert downward force on an IC package sufficient to hold the IC package in place on the platform and configured to exert lateral

force on an IC package and to thereby adjust the IC package in a horizontal direction bringing the IC package in contact with the positioning portions, and further configured to exert the combined edge moving forces on the IC package in a diagonal direction, the mechanisms being provided at virtually centers of the two adjoining sides of the IC socket, respectively;

wherein the edge moving mechanisms each have a latch lever, having an outer end pivotally supported on the IC socket and an inner end, and said edge moving mechanisms each further having a plate spring provided on an underside of the latch lever, said edge moving mechanisms collectively holding the IC package between the inner end of the latch lever and the platform; and

wherein, before the latch lever is fully closed, the plate spring engages a molded portion of the IC package, exerting a force sufficient to adjust the IC package in the horizontal direction.

10. An IC socket as claimed in claim 9, wherein the edge moving mechanisms are arranged by selecting a corner portion of the IC package mounting portion as a reference positioning portion.

11. An IC socket as claimed in claim 9, wherein the IC package is of a ball array type.

12. An IC socket as claimed in claim 9, wherein the edge moving mechanisms exert the lateral force adjusting the position of the IC package in the horizontal direction to bring the IC package into contact with positioning portions before the edge moving mechanisms exert the downward force sufficient to hold the IC package in place on the platform.

ISSUED CLAIMS  
Application No. 10/212,875  
U.S. Patent No. 6,752,645  
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Filed: August 7, 2002

1. A semiconductor device-socket comprising:

a socket body having an accommodation portion for accommodating a semiconductor device and electrically connectable to an input/output substrate for inputting/outputting a test signal relative to a plurality of terminals of said semiconductor device;

a frame member vertically movable in an upward position and a downward position relative to the socket body;

a plurality of rotationally movable arm members disposed along a perimeter of said accommodation portion;

a plurality of radiating members for providing heat transfer away from the semiconductor device; wherein each radiating member is held by one of the arm members; and

an arm member rotational movement mechanism, for rotationally moving each arm member in a first direction when the frame member is in the upward position so that said radiating member is able to contact a surface of said semiconductor device and rotationally moving each arm member in a second direction when the frame member is in the downward position so that said radiating member is able to separate from the surface of said semiconductor device.

2. The semiconductor device-socket of claim 1, wherein said radiating members are held by said arm members in a rotational movement manner so that the relative rotation of said radiating member relative to said arm members is restricted within a predetermined range by a positioning regulation member provided in said radiating member.

3. The semiconductor device-socket of claim 2, wherein said positioning regulation member is a plurality pin members selectively engageable with said arm members.

4. The semiconductor device-socket of claim 2, wherein said positioning regulation member is a plank-type member having a step selectively engageable with said arm members.

5. The semiconductor device-socket of claim 1, wherein said radiating member is a heat sink having a plurality of radiating fins.

6. The semiconductor device-socket of claim 1, wherein said radiating member is held rotationally movable by said arm members via a support shaft and biased

by a resilient member provided between the outer circumference of said support shaft and the inside of said radiating member in a predetermined direction.

7. The semiconductor device-socket of claim 1, further comprising one or more pressing bodies; wherein each pressing body is held by one of said arm members

so that each pressing body is brought into contact with the surface of said semiconductor device in the first direction and separated from the surface of said semiconductor device in the second direction.

8. A semiconductor device-socket comprising:

a socket body having an accommodation portion for accommodating a semiconductor device and electrically connected to an input/output substrate for inputting/outputting a test signal relative to terminals of said semiconductor device;

a radiating member held by arm members providing rotational movement in the circumference of said accommodation portion, for removing heat from said semiconductor device; and

an arm member rotational movement mechanism provided in said socket body, for rotationally moving said arm members in one direction so that said radiating member is brought into contact with the surface of said semiconductor device accommodated in said accommodation portion and rotationally moving said arm members in the other direction so that said radiating member is separated from the surface of said semiconductor device;

wherein said radiating member is held by said arm members in a rotational movement manner so that the relative rotation of said radiating member relative to said arm members is restricted within a predetermined range by a positioning regulation member provided in said radiating member.

9. A semiconductor device-socket comprising:

a socket body having an accommodation portion for accommodating a semiconductor device and electrically connected to an input/output substrate for inputting/outputting a test signal relative to terminals of said semiconductor device;

a radiating member held by arm members providing rotational movement in the circumference of said accommodation portion, for removing heat from said semiconductor device;

an arm member rotational movement mechanism provided in said socket body, for rotationally moving said arm members in one direction so that said radiating member is brought into contact with the surface of said semiconductor device accommodated in said accommodation portion and rotationally moving said arm members in the other

direction so that said radiating member is separated from the surface of said semiconductor device; and

wherein said radiating member is held by said arm members in a rotational movement manner so that the relative rotation of said radiating member relative to said arm members is restricted within a predetermined range by a positioning regulation member provided in said radiating member; and

wherein said positioning regulation member is a plurality pin members selectively engageable with said arm members.

10. A semiconductor device-socket comprising:

a socket body having an accommodation portion for accommodating a semiconductor device and electrically connected to an input/output substrate for inputting/outputting a test signal relative to terminals of said semiconductor device;

a radiating member held by arm members providing rotational movement in the circumference of said accommodation portion, for removing heat from said semiconductor device;

an arm member rotational movement mechanism provided in said socket body, for rotationally moving said arm members in one direction so that said radiating member is brought into contact with the surface of said semiconductor device accommodated in said accommodation portion and rotationally moving said arm members in the other direction so that said radiating member is separated from the surface of said semiconductor device; and

wherein said radiating member is held by said arm members in a rotational movement manner so that the relative rotation of said radiating member relative to said arm members is restricted within a predetermined range by a positioning regulation member provided in said radiating member; and

wherein said positioning regulation member is a plank-type member having a step selectively engageable with said arm members.

Customer No. 22,852  
Application No. 10/735,882  
Attorney Docket No. 04208.0197-00



PENDING CLAIMS  
Application No. 11/106,461  
Attorney Docket No. 04208.0217-0000  
Filed: April 15, 2005

1. A semiconductor device socket comprising:

a socket body provided with a semiconductor device accommodation portion for accommodating a semiconductor device and a group of contact terminals for electrically connecting the semiconductor device accommodated in said semiconductor device accommodation portion with external electronic circuits;

a holding device provided around said semiconductor device accommodation portion to be capable of selectively occupying either a position for holding the semiconductor device in said semiconductor device accommodation portion or a position for releasing the semiconductor device therefrom;

a holding device driving section for driving said holding device; and

a heat sink member detachably disposed in said socket body, having a contacting section brought into contact with an periphery of the semiconductor device disposed in said semiconductor device accommodation portion to cool the semiconductor device;

wherein when said heat sink member is attached to said socket body, the contacting section of said heat sink member is brought into contact with the periphery of the semiconductor device while the holding device occupies the released position by said holding device driving section.

2. A semiconductor device socket comprising:

a socket body provided with a semiconductor device accommodation portion for accommodating a semiconductor device and a group of contact terminals for electrically connecting the semiconductor device accommodated in said semiconductor device accommodation portion with external electronic circuits;

a heat sink member detachably disposed in said socket body, having a contacting section brought into contact with an periphery of the semiconductor device disposed in said semiconductor device accommodation portion to cool the semiconductor device, and

a fastening device provided in said socket body, for selectively fixing or releasing said heat sink member on said socket body.

3. A semiconductor device socket as claimed in claim 2, further comprising

a holding device provided around the semiconductor device accommodation portion to be capable of selectively occupying either a position for holding the semiconductor device in said semiconductor device accommodation portion or a position for releasing the semiconductor device therefrom, and

a holding device driving section for driving the holding device, wherein

when said heat sink member is attached to said socket body, the contacting section of said heat sink member is brought into contact with the periphery of the semiconductor device while the holding device occupies the released position by said holding device driving section.

4. A semiconductor device socket as claimed in claim 3, wherein the holding device comprises latch members provided to be movable rotationaly on the periphery of the semiconductor device accommodation portion, and said holding device driving section comprises a cover member coupled to said latch members and supported at said socket body to be movable upward and downward.

5. A semiconductor device socket as claimed in claim 4, wherein said heat sink member has pressing members for pressing said cover member via biasing means.

6. A semiconductor device socket as claimed in claim 2, wherein said heat sink member is provided with a mount selectively engaged with a lever member of said fastening device, and

said mount is supported by a spring member disposed between the same and a base section of said heat sink member to be movable by a predetermined distance in the thickness direction of the semiconductor device mounted to said socket body.

7. A semiconductor device socket as claimed in claim 1, wherein a heat transmission sheet is provided at the contacting section of the heat sink member, having a plurality of air coninunicating paths for introducing air between the periphery of the semiconductor device.

8. A semiconductor device socket as claimed in claim 7, wherein said heat transmission sheet contains graphite obtained by refining plumbago ore.

9. A semiconductor device socket as claimed in claim 1, wherein said holding device comprises latch members provided to be movable rotationaly on the periphery of the semiconductor device accommodation portion, and said holding device driving section comprises a cover member coupled to the latch members and supported at said socket body to be movable upward and downward.

10. A semiconductor device socket as claimed in claim 9, wherein said heat sink member has pressing members for pressing said cover member via biasing means.



Customer No. 22,852  
Application No. 10/735,882  
Attorney Docket No. 04208.0197-00

PENDING CLAIMS  
Application No. 11/212,706  
Attorney Docket No. 04208.0222-0000  
Filed: August 29, 2005

1. A method of mounting and demounting a semiconductor device comprises the steps of:

causing a holding operation of a semiconductor device handling portion for holding or releasing a semiconductor device to mount and demount it relative to a socket main body portion in and from which the semiconductor device is to be mounted and demounted; and

conducting an operation of bringing a pair of contact portions of a contact terminal close to each other and pinching an electrode portion of the semiconductor device by the pair of contact portions while carrying out an operation of moving the semiconductor device handling portion holding the semiconductor device to hold the electrode portion of the semiconductor device between the pair of contact portions of the contact terminal that is provided on said socket main body portion.

2. device for mounting and demounting a semiconductor device comprising:

a contact terminal drive controlling mechanism portion disposed at a socket main body portion in and from which the semiconductor device is mounted and demounted, for causing an operation of pinching an electrode portion of a semiconductor device with a pair of contact portions or an operation of releasing the same to be performed by

a contact terminal driving portion for performing a connecting operation at a contact terminal having a pair of contact portions, said contact portions selectively pinching the electrode portion of the semiconductor device to establish electrical connection;

a handling support mechanism portion for supporting a semiconductor device handling portion such that said handling portion can relatively move relative to said socket main body portion, said handling portion for holding or releasing the semiconductor device to mount and demount it in and from said socket main body portion; and

a control portion for causing said semiconductor device handling portion to perform the operation of holding the semiconductor device when the pair of contact portions of the contact terminal is kept in a release state by the contact terminal drive controlling mechanism portion and for causing the contact terminal drive controlling mechanism portion to perform the operation of pinching the electrode portion of the semiconductor device with the pair of contact portions while causing said handling support mechanism portion to perform the operation of moving said semiconductor device handling portion to hold the semiconductor device between the contact portions of the contact terminal of said socket main body portion.

3. A device for mounting and demounting a semiconductor device according to claim 2, wherein when starting the operation of pinching the electrode portion of the semiconductor device with said contact terminal drive controlling mechanism portion, said handling support mechanism portion presses the electrode portion of the semiconductor device toward the contact portion of the contact terminal using said semiconductor device handling portion.
4. A device for mounting and demounting a semiconductor device according to claim 2, wherein said handling support mechanism portion supports said semiconductor device handling portion through the elastic member for urging toward the contact portion of the contact terminal.
5. A device for mounting and demounting a semiconductor device according to claim 2, wherein said semiconductor device handling portion comprises a position regulating member for avoiding interference with the contact portion of the contact terminal when the semiconductor device is not held.
6. A socket for a semiconductor device comprising:
  - a socket main body portion having a contact terminal with a pair of contact portions for selectively pinching an electrode portion of a semiconductor device to establish electrical connection;
  - a slider movably disposed at said socket main body portion to bring the pair of contact portions of the contact terminal close to each other or moving them away from each other;
  - a latch mechanism for selectively holding or releasing the semiconductor device with the electrode portion of the semiconductor device disposed between the pair of contact portions of the contact terminal; and
  - a timing adjustment mechanism portion for adjusting said slider such that the timing at which the contact portions come close to each other to establish electrical connection with the electrode portion of the semiconductor device disposed between the pair of contact portions of the contact terminal is delayed from the timing at which the semiconductor device is held by said latch mechanism.
7. A socket for a semiconductor device according to claim 6, wherein the timing adjusting mechanism portion comprises slider holding means which holds said slider such that the pair of contact portions of the contact terminal are away from each other and slider releasing means which releases said slider held by said slider holding means.
8. A socket for a semiconductor device according to claim 6, wherein the timing adjusting mechanism portion is provided on a cover member supported on said socket main body portion such that it can be moved up and down to move said slider.

9. A socket for a semiconductor device according to claim 8, wherein said latch mechanism holds or releases the semiconductor device in conjunction with upward and downward movements of said cover member.

10. A socket for a semiconductor device according to claim 6, wherein the timing adjusting mechanism portion is provided at a material handling portion which can be made close to or moved away from said socket main body.

11. A device for mounting and demounting a semiconductor device comprising:

a socket main body portion having a contact terminal with a pair of contact portions for selectively pinching an electrode portion of a semiconductor device to establish electrical connection;

a slider movably disposed at said socket main body portion to bring the pair of contact portions of the contact terminal close to each other or moving them away from each other;

a latch mechanism for selectively holding or releasing the semiconductor device with the electrode portion of the semiconductor device disposed between the pair of contact portions of the contact terminal;

a handling support mechanism portion for supporting a semiconductor device handling portion for holding or releasing the semiconductor device to mount and demount it in and from said socket main body portion such that said handling portion can move relative to said socket main body portion; and

a timing adjustment mechanism provided at said handling support mechanism portion for adjusting said slider such that the timing at which the contact portions come close to each other to establish electrical connection with the electrode portion of the semiconductor device disposed between the pair of contact portions of the contact terminal is delayed from the timing at which the semiconductor device is held by said latch mechanism.